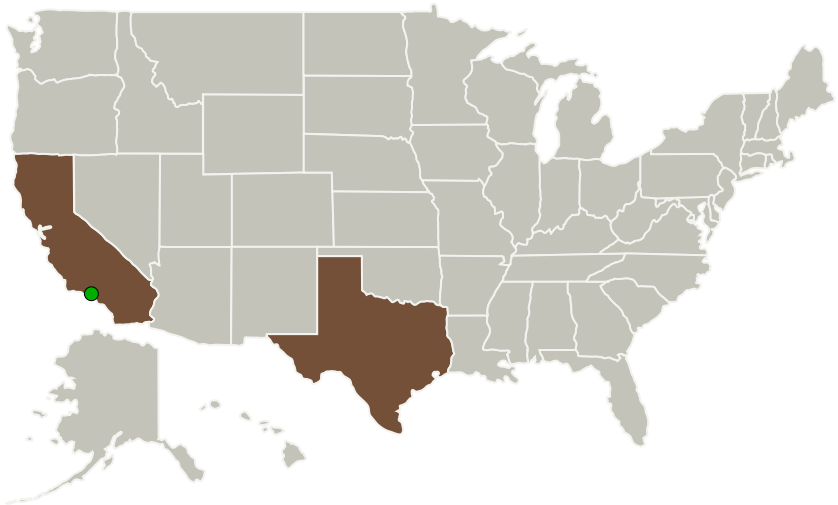
Low Power Nonvolatile Memory for Extreme Environments, Phase I

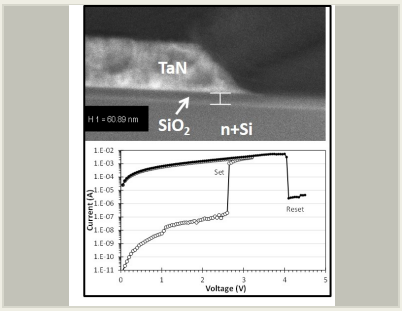
Completed Technology Project (2014 - 2014)

Project Introduction

Integrated circuits in NASA spacecraft and Robotic Exploration Technologies that enable exploration of the solar system planets, moons and small bodies must operate over large temperature extremes and mitigate radiation effects that can result in upset or destruction of devices. Development of a reliable, high-performance nonvolatile memory (NVM) is critical to successful NASA explorations and development of robotic exploration technologies designed to operate in the extreme temperature, pressure and radiation environments of planetary and lunar surfaces. PrivaTran has previously demonstrated an electronically-programmable resistor as a NVM element. Initial static data retention testing has shown tolerance to several radiation types and high thermal stress, thereby demonstrating the potential for use in radiation-hardened circuits for extreme environments. Device materials and fabrication processes are compatible with high-temperature semiconductor manufacturing platforms utilizing wide-bandgap semiconductor materials. The PrivaTran NVM device uses standard materials as the active switching medium and device electrodes can be formed either in the substrate material or within the interconnect layers of the integrated circuit (IC). As a result, NVM arrays can be integrated with wide-band-gap semiconductor materials in a three-dimensional (3D) architecture, resulting in a high-density memory with superior NVM performance and significant savings in size, weight, power and cost.

Primary U.S. Work Locations and Key Partners





Low Power Nonvolatile Memory for Extreme Environments Project Image

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
PrivaTran	Lead Organization	Industry	Austin, Texas
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Texas

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137700)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

PrivaTran

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

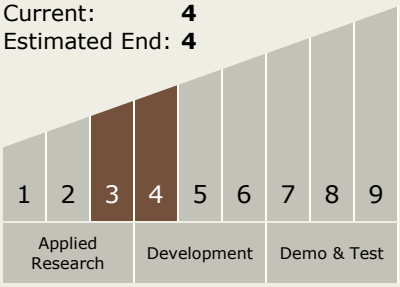
Carlos Torrez

Principal Investigator:

Burt Fowler

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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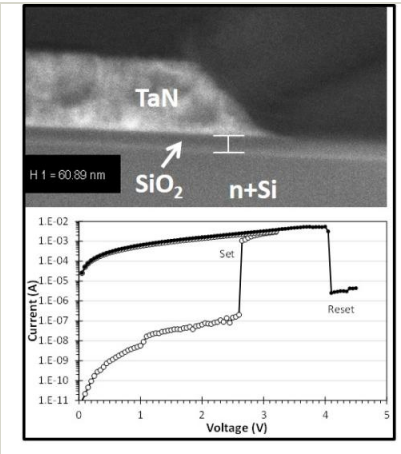
Images



Project Image
Low Power Nonvolatile Memory for Extreme Environments Project Image
(https://techport.nasa.gov/image/137014)

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.6 Radiation Hardened ASIC Technologies

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System